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SUMMER INSTITUTES ON FLUID POWER EDUCATION FOR VOCATIONAL AND TECHNICAL TEACHERS, 1966.

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DESCRIPTORS- *FLUID POWER EDUCATION, *SUMMER INSTITUTES, TRADE AND INDUSTRIAL EDUCATION, *TEACHER EDUCATION, *PROGRAM DESCRIPTIONS,

THESE INSTITUTES CONTINUED THE EMPHASIS OF THE 1964 AND 1965 INSTITUTES ON TRAINING TEACHERS TO TEACH FLUID POWER AND EVOLVING EFFECTIVE TECHNIQUES FOR INTRODUCING NEW TECHNOLOGIES TO EDUCATORS. THEY WERE ADMINISTERED BY THE FLUID POWER SOCIETY WHICH, THROUGH ADVISORY COMMITTEES, ESTABLISHED THE CONTENT, PROCEDURES, AND COORDINATION OF THE INSTITUTES IN THE FIVE COLLEGES OR UNIVERSITIES WHICH CONTRACTED TO PROVIDE THE FACILITIES AND INSTRUCTION--TRENTON STATE COLLEGE, BRADLEY UNIVERSITY, WAYNE STATE UNIVERSITY, HAMPTON INSTITUTE, AND CALIFORNIA STATE COLLEGE. MOST OF THE 75 PARTICIPANTS WHO CAME FROM 24 STATES, THE DISTRICT OF COLUMBIA, AND TWO OTHER COUNTRIES, WERE HIGH-SCHOOL OR COLLEGE LEVEL TEACHERS. THE INSTRUCTION INCLUDED EIGHT UNITS ON FLUID POWER AND A SEMINAR IN TEACHING FLUID POWER. CONVENTIONAL INSTRUCTION METHODS, TEACHING-DEMONSTRATION DEVICES, AND GUEST LECTURES AND CONSULTANTS WERE USED. THE PARTICIPANTS, WORKING AS TEAMS, DEVELOPED A RECOMMENDED CURRICULUM FOR THE EDUCATIONAL LEVEL OF PRIMARY INTEREST TO EACH TEAM. RESULTS OF PRE- AND POST-TESTS OF 50 PROBLEMS SHOWED AN INCREASE IN MEAN SCORES FROM 26.4 TO 46.2, INDICATING A HIGH DEGREE OF SUCCESS IN INSTRUCTIONAL COMPETENCY. IT WAS CONCLUDED THAT THE SUMMER INSTITUTE CAN BE A MOST EFFECTIVE VEHICLE FOR INTRODUCING A NEW TECHNOLOGY TO TEACHERS, SINCE IT OFFERS A CONTROLLED ENVIRONMENT AND THE EFFICIENT MEANS OF BRINGING TOGETHER THE TEACHERS AND EDUCATIONAL, INDUSTRIAL, AND TECHNOLOGICAL AUTHORITIES. THE PROFESSIONAL SOCIETY OF A NEW TECHNOLOGY CAN EFFECTIVELY ACT AS THE COORDINATING AGENCY OF PILOT PROGRAMS INVOLVING MULTIPLE SUMMER INSTITUTES. THE COMPLETE EVALUATION REPORT OF THE 1965 INSTITUTES IS PUBLISHED IN VT 002 870. (HC)

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1966 SUMMER INSTITUTES ON FLUID POWER EDUCATION FOR VOCATIONAL AND TECHNICAL TEACHERS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Submitted by

Theodore Pearce

March 1, 1967

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VT004200

The Fluid Power Society

Thiensville, Wisconsin

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Professor Gerald L. Baysinger, for his preparation of the Evaluation Instruments, direction of the evaluation study, and direction of the Wayne State University Institute.

Frederick W. Lamb, Flint Community College, for his services as Coordinator of the 1966 Institutes.

Raymond Fausel, Director of the Institute at California State College at Los Angeles.

John L. Frank, Director of the Institute at Hampton Institute.

Vincent Dresser, Director of the Institute at TrentonState College.

B. D. Hayes, Director of the Institute at Bradley University.

CONTENTS

Introduction 1

Method 2

Results 4

Summary and Conclusions 7

Appendix A -- Participants 11

Appendix B -- Budget and Expenses, Final Report 15

INTRODUCTION

The Problem

The basic problems which prompted this project are these:

1. A serious shortage of skilled workers and technicians trained in fluid power.

2. A serious shortage of teachers qualified to teach fluid power technology in industrial and vocational programs in the nation's schools.

3. Since fluid power is a relatively new technology, this project offered a unique opportunity to investigage the most effective techniques for introducing a new technology to educators.

During the summer of 1965, the U. S. Office of Education supported, as Contract No. OE-5-85-039 under the provisions of Section 4(c) of the Vocational Education Act of 1963, what was considered the first phase of an attack on this problem. This contract provided for summer institutes at five colleges on fluid power education, attended by 167 teachers of vocational and industrial education. Under careful planning and evaluation procedures wrought through close cooperation between representatives of the Division of Vocational and Technical Education, Office of Education, and the Fluid Power Society, the 1965 program was evaluated and judged to be extremely successful.

The complete evaluation report of the 1965 Institutes has been published, entitled, "The Fluid Power Institutes--A Pilot Program for Introducing Emerging Technologies," and is available from the Fluid Power Society. This report evaluated the effectiveness of several differing techniques used during 1965. During the 1966 Institutes, the more effective techniques were used, and also evaluated.

The U. S. Office of Education, in approving this project, as well as the companion project under Contract No. OEG 3-6-062278-0728 to evaluate the 1966 Institutes, supported the need for developing additional teachers qualified to teach fluid power, and provided for the further application and refinement of techniques found effective to introduce a new technology to teachers.

Purposes of the Project

The primary objectives of the project were:

1. To illustrate the growing importance of fluid power in industry and modern society.

2. To develop an adequate base of teachers in the United States qualified to teach fluid power.

3. To provide for instruction in basic fluid power theory and application, and to develop competencies in the Institute participants which will enable them to teach fluid power and to enlarge their knowledge thereof.

4. To identify desirable curricula with instructional units in fluid power on the junior, senior, and vocational high school levels, and at the technical institute - adult education levels.

5. To provide planning techniques for follow-up activities in the schools represented by the participants.

6. To determine the most effective techniques for the development of teachers in a new technology.

The ultimate objectives which will be realized through the above-mentioned objectives are these:

A. To prepare young people for gainful employment in industries which manufacture or use fluid power systems.

B. To provide pre-vocational preparation for young people to continue vocational education in fluid power.

C. To provide the groundwork for a continuing research project to evaluate the Institutes, and to research their results and techniques in terms of their effect on the participants, the participants' home schools, and their students.

Limitations

This Report presents only the operation of the Institutes in terms of programs and procedures. The Evaluation Report to be prepared under Contract No. OEG 3-6-062278-0728 will present the results of evaluation research and the impact of the Institutes on the Institute participants, their home schools, and their students.

METHOD

Administration of the Institutes was accomplished by the Fluid Power Society which, through advisory groups, established the content and procedures used, and the coordination of the Institutes. The Society subcontracted with five colleges or universities to provide the facilities and instruction.

The five institutions which conducted the Institutes under contract with the Fluid Power Society, the Institute Directors, and the Institute dates are as follows:

Trenton State College Trenton, New Jersey	Vincent Dresser, Director June 27-July 29, 1966
Bradley University Peoria, Illinois	B. D. Hayes,Director June 13-July 15, 1966
Wayne State University Detroit, Michigan	Gerald Baysinger, Director June 27-August 3, 1966
Hampton Institute Hampton, Virginia	John L. Frank, Director June 20-July 23, 1966

California State College
Los Angeles, California

Raymond Fausel, Director
August 1-September 2, 1966

Supervision of the Institutes was under the direction of Frederick Lamb, who was on leave from the Flint Community College, Flint, Michigan, and assigned as Institute Coordinator. Both prior to and during the Institutes he met with the Directors to establish procedures and to assure that each Institute conformed with the requirements.

A comprehensive set of evaluation instruments was printed prior to the Institutes and copies given to the Directors. The set of evaluation instruments and data derived therefrom will be incorporated into the Evaluation Report when the data are compiled and summarized. Included in the evaluation was a follow-up of participants to determine their progress in teaching fluid power during the year following the Institutes.

The evaluation instruments were similar to those used for the 1965 Institutes to provide for a basis of comparison between the 1965 and 1966 Institutes.

Following is the outline of content of each Institute:

Unit I:	Introduction to Fluid Power Fluid Power in Modern Industry, Applications Fundamental Laws of Hydraulics and pneumatics Symbols, Component and Circuit Identification
Unit II:	Hydraulic Oils, Reservoirs, Tubing, Fittings, and Filters; Types, Applications
Unit III:	Fluid Power Pumps and Compressors, Operation & Application Gear Type Vane Type Piston Type Air Compressors
Unit IV:	Fluid Power Controls (Valves), Operation & Application Pressure Controls Flow Controls Directional Controls
Unit V:	Fluid Power Cylinders (Linear Actuators), Operation and Applications
Unit VI:	Fluid Power Motors (Rotary Actuators), Operation and Applications Hydrostatic Transmissions
Unit VII:	Circuit Design and Circuit Applications, Hydraulic and pneumatic
Unit VIII:	Seminar in Teaching Fluid Power Discussion of Teaching Methods and Problems Development of Course Outlines Selection of Equipment, Supplies, and Training Aids
Unit IX:	Evaluation and Implementation of the Institute

Participants

A total of 75 participants were selected to attend the Insitutes. They met the following criteria:

> He must be a member of the teaching staff of a recognized secondary school, vocational school, or post-secondary school or teacher-training institution, under contract as of the Fall of 1966.
>
> He must be a teacher of vocational education or a strongly related field of industrial, technical, or teacher education. Teachers of industrial arts *per se* are not eligible.
>
> His home school should now offer, or intend to include, fluid power in its vocational or industrial education offerings. A written statement to that effect, signed by his superior, shall accompany his application.
>
> He must present evidence of interest in, or authority to organize and conduct, follow-up activities in the area of fluid power education in his school following participation in the Institutes.

Each of the Institutes carried academic credit (graduate) for those participants who arranged therefor with the college or university.

The participants came from 24 states, the District of Columbia, and two other countries. Seven participants from other countries were not provided with stipends under the contract, but carried their own expenses.

Of the total participants, 35 were high school teachers, 9 were vocational school teachers, 3 were community college teachers, 7 were technical institute teachers, 7 were teachers in four-year college technology programs, seven were teacher-educators, and 7 were unclassified (or in the process of changing from one type of program to another.

The names of the participants are listed in Appendix A.

Teaching-Demonstration Devices

Each of the institutions used at least three different commercially available fluid power teaching demonstration devices as part of the instructional program. These devices were those provided by the Office of Education to the Society under the 1965 Summer Institute program and included the following:

Vega Training Units
Capital Engineering Training Units
Technical-Education Training Units
Electromatic Training Units

RESULTS

Initial and Final Test Scores

A carefully weighed non-discriminatory set of 50 problems were included in an initial and final examination. The mean score of the initial examination was 26.4 with a standard deviation of 8.7. The mean score on the final examition was 46.2 with a standard variation of 4.5. It can be concluded, therefore, that the Institutes attained a high degree of success in instructional competency. Further analysis will be given to this aspect of the program in the Evaluation Report.

Instruction

Each Institute had a full-time Director and at least one full-time instructor. Based on the results of the 1965 Institutes, a more nearly ideal situation was found to exist where the Director was not involved in the teaching, and where a majority of the instruction was provided by an educator.

Each Institute also used guest lecturers.

An analysis of the evaluation of instruction will be included in the final Evaluation Report. Here, however, are preliminary analyses of the evaluation of instruction:

1. Appraisal by participants of the full-time instructors was 1.2 on a scale of 1 (high) to 5 (low).

2. Appraisal by participants of guest lecturers was 1.12 on the same scale.

This confirmed the 1965 evaluation that guest lecturers were slightly less effective. However, the small difference between the appraisal of both guests and full-time instructors indicated good planning and preparation for guest instruction.

The high quality of instruction was not diminished by the numbers of persons who volunteered to serve as guest lecturers and consultants to the five Institutes. One hundred and five persons served in these capacities, donating a total of 412 contact hours to the five Institutes. Most of these persons were supplied without charge by the fluid power industry.

Instructional Materials and Teaching Aids

Aside from providing many guest lecturers and consultants, the fluid power industry was most generous in donating instructional materials and training aids. Following is a summary of such donations:

Catalogs	3,791
Manuals	1,363
Technical Reports	3,427
Component Devices	682
Books	75
TOTAL	11,208

Thus, each participant, on the average, was supplied with 150 copies of instructional materials for later use in his home school.

Educational Plans of Participants

We can report here what educational plans were made by the participants to introduce fluid power technology into the curriculum of their home schools. However, those plans which reached fruition a year later will be included in the final Evaluation Report.

Activity	Number
1. Introduce fluid power as a unit of an existing course	34
2. Introduce a course in fluid power	20
3. Add one or more courses to make a curriculum in fluid power	5
4. Add laboratory and demonstration devices to an existing laboratory	35
5. Remodel facilities to provide a separate fluid power laboratory	13
6. Prepare a course of study for:	
a. An existing course	17
b. A new unit or course	39
7. Establish professional relationships with a local chapter of the Fluid Power Society	43
8. Obtain assistance of local members of FPS	
a. As an unofficial advisory group	20
b. As an appointed advisory committee	10
9. Involve the advisory group in:	
a. Constructing courses of study	17
b. Selecting laboratory devices	20
c. Selecting instructional materials	17
d. Selecting teaching aids	20
e. Placement of graduates	19
f. Other	3
10. Prepare an evening program for employed adults	20
11. Work with a curriculum committee to prepare curriculum guides for a city or state	9
12. Other	11
TOTAL ACTIVITIES	372

In round number, therefore, each participant on the average chose five activities planned for the future in fluid power education.

Expenses

Although the five Institutes had planned to accommodate a total of 105 participants, the fact that 75 were actually selected was the result of the comparably low participant support that was offered. Each participant was provided with an allowance equal to the cost of dormitory room and board at each institution plus four cents per mile travel with a maximum of $16.00. It is felt that many qualified participants would have applied had the allowance been equivalent to that offered by the National Science Foundation for summer institutes for educators.

On the other hand, since the participants attended at a personal sacrifice, it is also felt that the group was more highly motivated than the average. This impression was emphasized by each of the Institute Directors.

A summary of total expenditures is included in Appendix B.

SUMMARY AND CONCLUSIONS

It would be difficult to separate the 1965 and 1966 Institutes in drawing conclusions either on the success of the program or on the broader concept of the effectiveness of these programs in introducing an emerging technology. The following conclusions were common to both programs, and were confirmed by the 1966 Institutes:

1. The Summer Institute as a Vehicle for Introducing the Technology

   The summer institute per se can be a most effective vehicle for introducing a new technology to teachers, since it offers a controlled environment and the efficient means for bringing together, (1) industrial and technological authorities, (2) educational authorities on educational subject matter and curriculum planning, and (3) teachers who are motivated to develop new competencies.

2. Administering an Institute Pilot Program

   The responsibility for planning, administering, and evaluating the Summer Institutes was the primary responsibility of the Fluid Power Society. It sub-contracted with five institutions to provide the facilities and instruction: Trenton State College (New Jersey), Hampton Institute (Virginia), Wayne State University (Michigan), Bradley University (Illinois), and California State College at Los Angeles. Administration was judged to be effective.

   A new technology should work through the professional society which represents it as the chief coordinating agency of pilot programs involving multiple summer institutes. The professional society can effectively act as the unifying agency in activities involving cooperating educational institutions and participants.

3. Selection of Participating Institutions

   In making the contract grant to the Fluid Power Society, the United States Office of Education allowed the Society wide latitude in selecting those institutions to receive a sub-contract for the Summer Institutes. Aside from meeting the general conditions qualifying them for federal grants and contracts, these criteria guided the

Society in selecting the five sub-contractors:

1. A prior Summer Institute participant was available to direct the program.

2. The institution gave evidence of interest in fluid power education.

3. Institutions were geographically located to serve all areas of the country.

4. Personnel were available from local industry to serve as guest lecturers and counselors.

4. Staffing of the Pilot Program

The Fluid Power Society provided the following "overseers" of the institute program: The Principal Investigator who was the Executive Vice President of the Fluid Power Society and chief administrator of the program; the Coordinator who provided liaison between the Society and the five participating institutions; and a Consultant who directed the design of the evaluation instruments and who directed the evaluation.

The more ideal situation was found to exist where the Director had no instructional duties, and where a staff instructor was responsible for the majority of the instruction and academic content. The least ideal situation was found to be where there was no staff instructor, and where all of the instruction was provided by guest lecturers from industry and other institutions.

5. Content and Activities

In addition to the regular day institute program, each institute provided professional-social activities, including informal meetings with local chapters of the Fluid Power Society, and planned social events. Weekly evening workshops were also held for review of content and for self-help of participants with the cooperation of the instructors and guest lecturers.

Participants were divided into teams for curriculum development. Each team developed a recommended curriculum for the educational level of primary interest to each team (for example, high school, vocational, post secondary school, and teacher-preparation).

A uniform final examination was administered to all participants at the conclusion of the institutes. The results of the final examination were used as a method of discovering which kinds of instructors (guest lecturers, resource persons, or full-time instructor) were most effective.

Commercially available teaching-demonstration units were effective, and provided valuable laboratory experiences. Further, the teacher newly introduced to a technology should not be expected to design such equipment for his own school, but should initially depend on pre-tested devices.

Seminars were effective because they provided the participants with materials necessary for conferences with their school administrators upon their return to their teaching assignments.

Since participants were offered limited maintenance allowances for dependents, few were accompanied by their families, or lived "off campus." Since the introduction of a new technology requires intensive exposure during an institute, results appear to be best when participants leave their families at home, and live together in campus facilities.

Finally, institute programs of this nature should carry graduate credit, and arrangements should be made whereby participants may earn such credit. The more ideal situation exists where the participant may earn credit without the payment of additional tuition.

6. The Use of Advisory and Evaluation Committees

Initial planning of the Summer Institutes was accomplished with the help of the Council on Fluid Power Education. This group includes representatives of the following organizations: Fluid Power Society, National Fluid Power Association, National Association of Industrial Teacher Educators, American Vocational Association, American Society for Engineering Education, and the American Technical Education Association. Thus, a broad representative base of support was obtained.

Further advisory groups included the Education Committee of the Fluid Power Society and the Education Board of the National Fluid Power Assocation. These groups provided valuable counsel in the determination of the Institute curriculum.

The evaluation was conducted under the direction of an Evaluation Committee, made up of representatives of State vocational education departments, teacher education institutions, technical institutes, and industry. This Committee met during the month of October following the close of the 1966 Summer Institutes and reviewed all of the data secured through evaluation procedures. Its analysis and recommendations will be incorporated in the final Evaluation Report.

The use of existing committees in planning Institute activities was proved to be most effective in eliciting support and advice from authorities and national organizations who share interest in the Institutes. The Evaluation Committee functioned unusually effectively. Expense for its meetings and activities were a part of the supporting contract and rightly so, for evaluation is an essential part of an educational activity.

7. Evaluation Procedures

Five aspects of the Institutes were evaluated; these were:

1. Suitability of laboratory and demonstration devices, workbooks and laboratory manuals.

2. Quality of instructional program.

3. Cooperation of industry.

4. Qualification of participants.

5. Follow-up of participants.

Uniform evaluation forms were prepared and distributed to the Institute Directors. Both the Directors and participants filled out the various forms.

During the Institutes each participant was asked to select up to 17 follow-up activities which he hoped to accomplish when he returned to his home school, ranging from the organization of a curriculum advisory committee to the introduction of courses and curricula in fluid power. The participants named 372 specific activities, an average of 5 per participant.

Evaluation is necessary in any effort to introduce a new technology. It must be carefully planned, and uniformly applied. It should include evaluation by the participants themselves, by the Institute Directors, and by an Evaluation Committee. A follow-up of participants is essential.

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APPENDIX B

SUMMARY OF EXPENSES

FINAL REPORT

"Operation of Summer Institutes on Fluid Power Education for Teachers of Vocational and Technical Education"

Grant Number: OEG-3-6-062203-0734

Project Number: 6-2203

Amount: $47,553

Contractor: The Fluid Power Society
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NOTE: On the original Budget Worksheets the costs of Participant Maintenance were included in each of the budgets of the sub-contracting colleges and universities. However, in administering these disbursements, the Society made direct payments to the participants, not through the subcontractor. Therefore, the expenses for participant maintenance will be included as a unified single item in this report.

	Expended	Budgeted
1. Participant Maintenance		
Dormitory Room & Board	$ 10,492.00	$ 14,422.00
Travel	710.28	1,862.00
Sub-Total	$ 11,202.28	$ 16,284.00
2. Trenton State College		
Personnel Salary & Wages	$ 3,762.00	$ 4,170.00
Employee Benefits	362.00	362.00
Travel & Field Trips	65.60	471.00
Office Supplies & Materials	445.13	808.00
Communications	159.00	159.00
Total Direct Costs	$ 4,793.73	$ 5,970.00
Indirect Costs (8 percent)	383.50	476.00
Sub-Total, All Costs	$ 5,177.23	$ 6,446.00
3. Hampton Institute		
Personnel Salary & Wages	$ 4,528.33	$ 4,955.00
Employee Benefits	---	---

SUMMARY OF EXPENSES

Hampton Institute (Cont'd)	Expended	Budgeted
Travel & Field Trips	$ 263.88	$ 360.00
Supplies & Materials	1,644.45	1,100.00
Communications	56.33	100.00
Total Direct Costs	$ 6,492.99	$ 6,515.00
Indirect Costs (8 percent)	519.44	523.00
Sub-Total, All Costs	$ 7,012.43	$ 7,038.00
4. Wayne State University		
Personnel Salary & Wages	$ 4,786.00	$ 5,412.00
Employee Benefits	297.60	470.00
Travel & Field Trips	---	50.00
Supplies & Materials	---	---
Communications	15.30	50.00
Total Direct Costs	$ 5,098.90	$ 5,982.00
Indirect Costs (8 percent)	407.91	476.00
Sub-Total, All Costs	$ 5,506.81	$ 6,458.00
5. Bradley University		
Personnel Salary & Wages	$ 4,476.00	$ 4,793.00
Employee Benefits	341.76	347.00
Travel & Field Trips	245.00	360.00
Supplies & Materials	502.67	250.00
Communications	70.65	100.00
Total Direct Costs	$ 5,636.08	$ 5,850.00
Indirect Costs (8 percent)	450.89	468.00
Sub-Total, All Costs	$ 6,086.97	$ 6,318.00

SUMMARY OF EXPENSES

6. California State College at L. A.	Expended	Budgeted
Personnel Salary & Wages	$ 3,768.32	$ 4,060.00
Employee Benefits	164.30	---
Travel & Field Trips	257.13	360.00
Supplies & Materials	54.29	118.00
Communications	9.35	100.00
Total Direct Costs	$ 4,253.39	$ 4,638.00
Indirect Costs (8 percent)	340.27	371.00
Sub-Total, All Costs	$ 4,593.66	$ 5,009.00

RECAPITULATION -- Total of Sub-Totals

Participant Maintenance	$ 11,202.28	$ 16,284.00
Trenton State College	5,177.23	6,446.00
Hampton Institute	7,012.43	7,038.00
Wayne State University	5,506.81	6,458.00
Bradley University	6,086.97	6,318.00
California State College at L. A.	4,593.66	5,009.00
TOTAL COSTS	$ 39,579.38	$ 47,553.00
Advance Payments by U. S.	42,797.00	
Overpayment by U. S. (Refund)	$ 3,217.62	